

---

# Problem of the Week

## Solution Ten

---

**PROBLEM:** *What is the largest positive integer  $n$  for which  $n^3+100$  is divisible by  $n+10$ ?*

**SOLUTION:** The answer is  $n = 890$ .

The trick is to carry out some polynomial long division. We find that

$$\frac{n^3 + 100}{n + 10} = (n^2 - 10n + 100) + \frac{900}{n + 10}$$

For this to be an integer, we must have that  $\frac{900}{n+10}$  is an integer. To maximize  $n$ , we want  $n + 10$  to be the largest divisor of 900, which is 900 itself. This gives  $n = 890$ , as claimed.

**POTW SHALL RETURN IN FALL 2016!**